Exhibit 15

Report of Professor Thomas McGuire

Regarding Public Nuisance

March 25, 2019

with similar analyses sponsored by numerous public and private agencies throughout the United States (albeit typically applicable to broader geographic communities).

15.   Third, I am of the opinion, again to a reasonable degree of certainty in the area of applied microeconomics, that the estimated magnitude of the net economic burden imposed on the Bellwether communities over the period 2006-2016 is approximately $20 billion. The major components of this harm, as measured in economic terms, are shown in Table 1. These dollar values of harms are net of any benefits provided by prescription opioid shipments.

Table 1
Summary of Monetary Value of Harms Due to Prescription Opioid Shipments
2006-2016
($millions)

Harms Due to Defendants' Shipments	Cuyahoga	Summit	Total
Excess deaths	$11,279	$5,377	$16,656
Excess morbidity	$1,376	$587	$1,963
Excess neonatal abstinence syndrome	$9	$7	$16
Excess crimes	$327	$126	$453
Excess child maltreatment	$401	$297	$698
Excess costs to Bellwether governments	$172	$99	$271
Totals	*$13,564*	*$6,492*	*$20,056*

Sources: Tables 5a, 5b, 7a, 7b, 8a, 8b, 9a, 9b, 10a, 10b and 11 of this Report.

II. The Economic Analysis of Public Nuisances

A. Public Nuisance and Negative Externalities

16.   I rely on the long tradition within economics of analyzing the social consequences of private behaviors imposing costs on others. A public nuisance, in economic terms, is generally observed when an action (or set of actions) undertaken by a party (or group of parties) gives rise to overwhelming "negative externalities." An externality "occurs whenever the actions of one party make another party worse or better off, yet the first party neither bears the costs nor receives the benefits of doing so."[12]

17.   A negative externality imposes costs on others. An example of a negative externality is pollution of a river.[13] If a household or firm deposits waste in the river, other members of the community are harmed (*e.g.*, bear health risks, enjoy less recreational use of the river) but they are not compensated for the costs imposed on them. In economics, harms, such as health risks or loss of recreational opportunities, are regarded as a "cost" imposed on others and can sometimes be valued in dollar terms.

18.   The legal concept of a public nuisance parallels the concept of a negative externality in economics. An externality is created when a private actor harms others and does not compensate others for those effects. If the negative externality satisfies the other components of the definition mentioned earlier, it qualifies as a public nuisance. "Nuisance may also be

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[12] J. Gruber, *Public Finance and Public Policy*, 5th edition, 2016. p. 124.

[13] An externality can be positive as well, that is, confer benefits on others. A neighborhood association might maintain a local park that is open to the public, benefiting those outside the immediate neighborhood as well as residents of the neighborhood.

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viewed as a form of externality that interferes with the enjoyment or use of another's property."[14] The economic framework of an externality provides a natural parallel with the legal notion of a public nuisance.[15]

19.   In a related approach, scholarship in law and economics has sometimes referred to a public nuisance as a "public bad": "The common law of public nuisance has evolved for dealing with public bads. When an agent imposes a cost, similar in amount and kind, on a group of individuals, then the harmed group can call upon a public defender to bring a public nuisance action against the agent."[16] "Public bads are . . . said to emerge when a large number of parties are affected negatively and simultaneously, at the margin, by an action undertaken by an individual or group. The nature of the phenomenon is such that there is no low-cost way to insulate and partition the affected individuals in the group from the negative effect. What one group member receives, all receive."[17] Public bads are a form of negative externality, and I will

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[14] T. Swanson and A. Kontoleon, "Nuisance (Section 2100)," in B. Bouckaert and G. de Geest (eds.), *Encyclopedia of Law and Economics*, 2000, pp. 380-402. See also, R. Cooter and T.S. Ulen (2016), *Law and Economics*, 6th *Edition*, Berkeley Law Books, 2, p. 183.

[15] I have been instructed by counsel that unlike a private nuisance, a public nuisance does not necessarily involve interference with the use and enjoyment of land because a common law nuisance is the doing of or the failure to do something that injuriously affects the safety, health or morals of the public, or works some substantial annoyance, inconvenience or injury to the public. See Restatement (Second) of Torts (1977) § 821B (at common law, a public nuisance is defined as an unreasonable interference with rights held by the public in general, not merely with the rights or interests of a few individuals). I also understand that a public nuisance suit may be brought either by the state through its attorney general or through another public official or public agency representing the state or one of its political subdivisions through a statutory public nuisance claim, and that Cuyahoga and Summit counties both have such claims against Defendants here.

[16] K. Boudreaux and B. Yandle, "Public Bads and Public Nuisance-Common Law Remedies for Environmental Decline," *Fordham Environmental Law Review*, 14(1) Article 2, 2002, pp. 55-88.

[17] *Ibid.*, p. 59-60.

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39.   Before proceeding, it will be useful to briefly identify the Defendants' drugs at issue in

this matter. The drugs in the case are Schedule 2 opioids, excluding injectables and all

buprenorphine drugs except Butrans, [51] manufactured and distributed by the Defendants. The

Defendants account for the vast majority of these Schedule 2 drugs as illustrated in Figure 1

below.[52] I understand from counsel that a showing that the majority of these drugs are at issue

in this litigation is important because it is evidence relevant to the fact-finder's determination

that the Defendants' conduct was a substantial contributing factor in creating the nuisance. As

a reminder, the harms I attribute to shipments of prescription opioids includes harms due to

the subsequent use of other opioids (*e.g.*, heroin, fentanyl) caused by the shipments.

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[51] Butrans is a Schedule 3 drug.

[52] Figure 1 is reproduced from Rosenthal Report, Attachment C. These data are based on IQVIA National Prescription Audit (NPA) retail sales of extended units (*e.g.*, number of pills) of Schedule 2 drugs (plus Butrans) by manufacturers by month. The MME for a pill of each drug is computed based on an MME conversion factor obtained from the CDC times the milligram strength of the pill. I understand that Information on the Defendant status for each manufacturer was provided by counsel.

Figure 1
Defendants' Shipments and Total Shipments
[Source: Rosenthal Report, Attachment C]
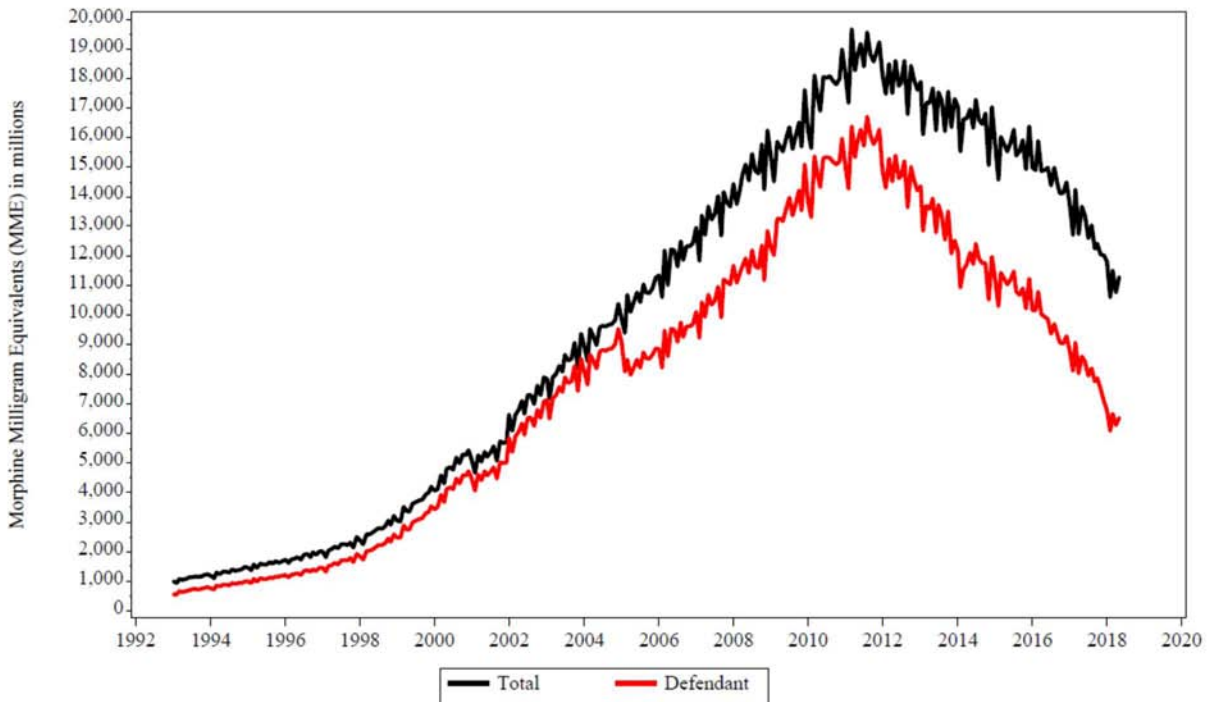
B. Shipments Interfered with Public Health, Safety, Peace and Comfort of Members of the Bellwether Communities with Continuing and Long-Lasting Effects

40.   The most obvious and consequential negative impact of opioid shipments is death. As discussed by Professor Gruber, more than 47,000 Americans died from an opioid overdose in 2017, a death toll greater than deaths due to guns or to H.I.V. at the peak of its epidemic.[53] The opioid crisis has hit the Bellwether counties particularly hard. Professor Gruber notes that between 2010 and 2016, the opioid mortality rate in Cuyahoga County increased by 280 percent and in Summit County increased by 362 percent, compared to the overall U.S. large

[53] Gruber Report ¶ 7.

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county opioid mortality rate of 88 percent.[54] Both Summit and Cuyahoga counties were among

the top 7 percent of U.S. counties in terms of opioid mortality rates in 2016.[55]

41.   Figure 2 (Figure I.10 from the Gruber Report) shows the rates of shipments of

prescription opioids (measured in MMEs per capita per day) in the Bellwether counties. The

magnitude and shape of the curves for the Bellwethers showing rates over 2006-2016 are

similar to the national trends, all peaking in 2010/11. Figure 3 (Figure I.11 from the Gruber

Report) graphs opioid mortality rates for the Bellwether counties and the national average for

large counties.[56] Up until the turning point of 2010/11 in the rate of shipments, the death rates

nationally for large counties and in the Bellwethers were similar and growing only slowly. After

2010, however, death rates escalated dramatically in both Cuyahoga and Summit counties,

vastly outpacing national increases for large counties.

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[54] Gruber Report, ¶ 65.

[55] Gruber Report, ¶ 65.

[56] The Gruber Report indicates at ¶ 36 that large counties are those with a population greater than 100,000. He notes at his footnote 48 that "The simple correlation between the national opioid-related mortality rate and the total rate in the large county sample is 0.996."
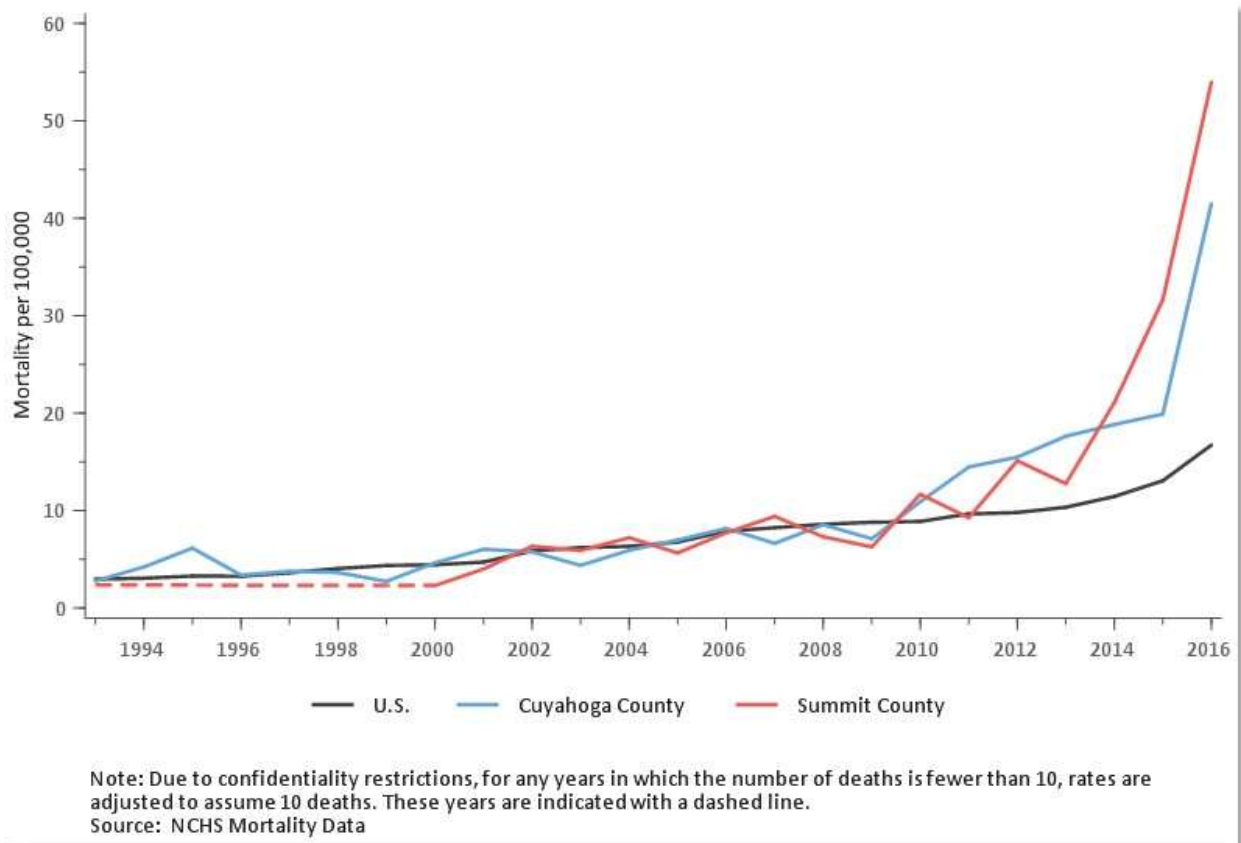
Figure 2
Shipments of Prescription Opioids: 1997-2016
Bellwether Counties and U.S. Total
[Source: Gruber Report, Figure I.10]

Source: ARCOS and Census Data
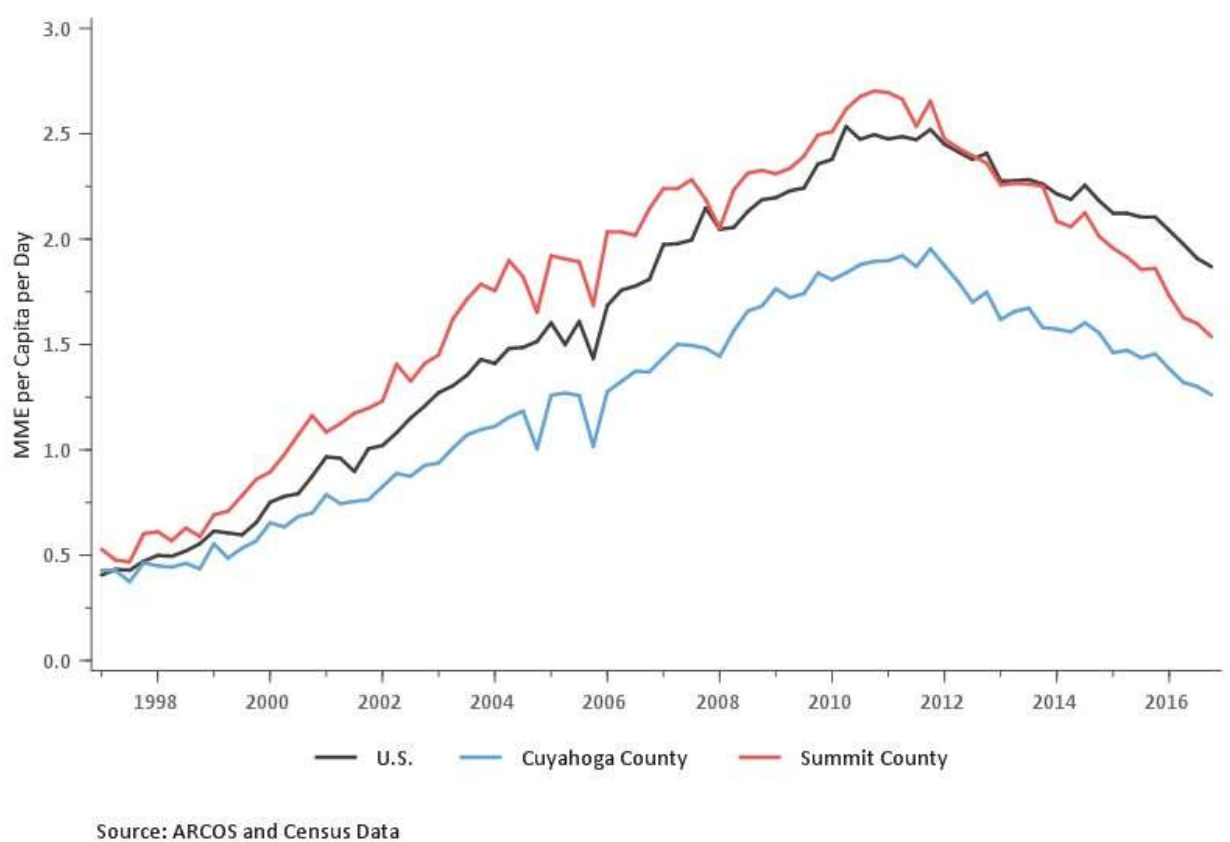
Figure 3
Opioid Mortality Rates: Bellwether Counties v. U.S. Large Counties
[Source: Gruber Report, Figure I.11]

Note: Due to confidentiality restrictions, for any years in which the number of deaths is fewer than 10, rates are adjusted to assume 10 deaths. These years are indicated with a dashed line.
Source: NCHS Mortality Data

42.   Death is not the only negative impact. Professor Cutler empirically assesses the impact

of shipments of prescription opioids on three forms of harms: on the rates of mortality, on the

rates of crime, and on the number of children needing foster care placement in the Bellwether

communities. In this Report, I broaden the scope of harms to children by quantifying child

maltreatment (only some of which results in foster care). I also add tallies of the rates of

morbidity and of neonatal abstinence syndrome (NAS). I then use the magnitude of these five

harms (mortality, morbidity, crime, child maltreatment and NAS) to establish the existence of

significant long-term negative effects of shipments on the public health, safety and peace of members of the Bellwether communities.[57] Later, in Section IV of this Report, I value these harms in dollars.[58] These five are not the only forms of harm associated with shipments; these five are, however, sufficient in my view to establish the existence of widespread and ongoing interference to public health and welfare from the Defendants' opioid shipments. In the remainder of this section, I discuss my methods for quantifying the five harms on which I focus in this Report.

Mortality

43.   Professor Cutler applied two empirical approaches to estimate the opioid-related mortality attributable to opioid shipments. His Approach 1 uses the results of a "direct" regression model that estimates the relationship between changes in opioid-related mortality and shipments of prescription opioids between 1995-2010, while controlling for other key variables likely to explain the growth in mortality over that time period. He uses this regression model to estimate the share of mortality attributable to shipments for all opioids through 2010 and the share of mortality attributable to prescription opioids only for 2011-2016. This is combined with an "indirect" regression model that estimates the illicit opioid mortality that is

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[57] Professor Cutler estimated the share of studied harms due to Defendants' misconduct by multiplying Professor Rosenthal's estimated share of shipments due to misconduct by his own estimate of the share of harms due to shipments. In this Report, I assess the external costs associated with prescription shipments without regard as to whether they were due to Defendants' misconduct. I thus use the share of harms due to shipments without multiplying by Professor Rosenthal's estimate of the share of shipments due to misconduct.

[58] Professor Cutler was concerned with the impact of prescription opioid shipments on Bellwether governments, so therefore did not address some harmful effects of these shipments, such as mortality costs not falling on Bellwether governments, the cost of crime to victims, lost productivity, and other categories of harm that will be considered here.

attributable to shipments from 2011 through 2016. This second regression model estimates

the relationship between illicit opioid mortality and the economic and demographic

characteristics of counties over the 2008-2010 period, yielding an estimate of illicit opioid

mortality rates for 2011-2016 that would have been expected to prevail in the absence of the

reformulation of OxyContin and the reduction in opioid shipments. Combining these two

regression models gives Professor Cutler the full effect of shipments on mortality due to licit

and illicit opioids over the full time period, 1995 through 2016.[59]

44.   His Approach 2 calculates the share of opioid mortality due to shipments based on an

indirect regression model that estimates the relationship between opioid mortality and the

economic and demographic characteristics of counties similar to Cuyahoga and Summit over

the 1993 to 1995 period. This analysis is based on the period before the launch of OxyContin

and the subsequent acceleration in the growth of prescription opioid shipments, and thus yields

estimates of opioid mortality rates that would have been expected to prevail in the absence of

these events. Professor Cutler uses this method to calculate a second estimate of the percent

of opioid mortality that is attributable to shipments for 2006 through 2016.[60]

45.   Professor Cutler's Approach 1 and Approach 2 lead to broadly similar quantitative

estimates of the effect of shipments on mortality. In the text of this Report, I focus on

Professor Cutler's results from his Approach 1 which yields more conservative calculations as

inputs for my analysis. This choice is not meant as a comment on the appropriateness of

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[59] For more details on Professor Cutler's Approach 1, see Cutler Report, Section VI.A.

[60] For more details on Professor Cutler's Approach 2 see Cutler Report, Section VI.B. Also see Cutler Report, Appendix III.I, Tables I.4 and I.5 for Professor Cutler's estimates of harms attributable to all shipments.

Approach 1 over Approach 2 but is simply done for ease of discussion in the text of this Report.

Although the dollar amounts attributable to my conclusions of the public nuisance calculations

undertaken here change depending on which of the approaches I use, my other conclusions do

not change based on the approach chosen. For completeness, I repeat my analysis presented in

the body of this Report, in Appendix I, using Approach 2.

46.   I apply Professor Cutler's estimates of the share of opioid-related mortality due to

shipments to the death rate in each county in each year to determine the absolute numbers of

deaths each year attributable to shipments in Cuyahoga and Summit counties.[61] Over the

entire 11-year period from 2006-2016, 2,158 deaths in the Bellwether counties can be

attributed to opioid shipments.[62] I emphasize that these are not just opioid-related deaths;

these are, based on Professor Cutler's findings, opioid-related deaths *attributable to*

Defendants' shipments of prescription opioids.

47.   These shipment-related deaths can be put in perspective by comparing them to the

number of deaths from firearms in each year in each county.[63] In broad terms, the number of

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[61] Mortality data are based on the Multiple Cause of Death (MCOD) files published by the National Center for Health Statistics (NCHS), part of the Centers for Disease Control and Prevention (CDC). See https://www.cdc.gov/nchs/index.htm. These data are generated from death certificates and report mortality by cause of death and by county of residence. A single death may have multiple causes. Opioid overdose deaths have an underlying cause of death code related to drug poisoning and one or more additional codes related to opioids. Because some overdose fatalities fail to identify the underlying drug associated with the death, these numbers are conservative. Note that in the Cutler Report, these numbers are adjusted by following the procedures outlined in Ruhm (2018) to allocate these unidentified drug overdoses as either opioid-related or non-opioid related (See C.J. Ruhm, "Corrected US Opioid-Involved Drug Poisoning Deaths and Mortality Rates, 1999–2015," *Addiction*, 113, 2018, pp. 1339-1344).

[62] See Tables 5a and 5b in Section IV of this Report for a summary by year of deaths due to prescription opioid shipments. See Appendix C for a discussion of the data sources and calculation methods.

[63] Firearm-related deaths are downloaded from CDC's Wonder data tool and are based on the same underlying MCOD data as opioid mortality. Cause of death codes to identify firearm-related deaths are based on Xu *et al.* (2018) (J. Xu, *et al.*, "Deaths: Final Data for 2016," *National Vital Statistics Reports*, 67(5), July 26, 2018).

people killed by opioid shipments over this period was roughly the same as those killed by guns.[64] By 2016, however, shipments were killing over twice as many people as guns in Cuyahoga County and more than three times as many people as guns in Summit County.[65]

Morbidity

48.   In addition to the public harms from deaths due to opioid shipments, harms result from opioid-related morbidity. Morbidity simply means to have a disease or be in ill health. Opioid use disorder (OUD) is a substance use disorder that is diagnosed by health care providers using specific assessment criteria from the Diagnostic and Statistical Manual of Mental Health Disorders.[66] Individuals with OUD are at a high risk of death. OUD is a chronic disease, meaning once ill with OUD, a person may remain ill for years.[67] According to the CDC, there were 2.1 million Americans with OUD as of 2016.[68] The disorder is defined as a "problematic pattern of opioid use leading to clinically significant impairment or distress,"[69] and is diagnosed

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[64] There were 1,772 deaths due to firearms in Cuyahoga County from 2006 through 2016 and 2,114 deaths due to opioid shipments. In Summit County, there were 604 deaths due to firearms and 804 deaths due to opioid shipments. See Centers for Disease Control and Prevention (CDC), Wonder data for data on deaths by firearms by County (available at https://wonder.cdc.gov/controller/datarequest/D77).

[65] *Ibid.*, In 2016 there were 235 firearm deaths in Cuyahoga County and 68 in Summit County compared to 504 deaths due to opioid shipments in Cuyahoga County and 269 in Summit County.

[66] Substance-Related and Addictive Disorders in: American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders,* 5th edition, DSM Library. Arlington, VA, 2013.

[67] National Institute on Drug Abuse, Addiction is a Chronic Disease, available at https://archives.drugabuse.gov/publications/drug-abuse-addiction-one-americas-most-challenging-public-health-problems/addiction-chronic-disease.

[68] CDC, Module 5: Assessing and Addressing Opioid Use Disorder (OUD), available at https://www.cdc.gov/drugoverdose/training/oud/accessible/index.html.

[69] Substance-Related and Addictive Disorders, *op. cit.*

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by evaluating patients for at least two of 11 clinical symptoms within a 12-month period.[70]

"OUD exists on a continuum of severity … based upon the number of criteria that have been

met."[71]

49.   Determining the morbidity in the Bellwether counties due to shipments of prescription

opioids proceeds in two steps. I first estimate the overall prevalence of OUD in the Bellwether

counties for 2006 through 2016, and second, I estimate the share of this morbidity attributable

to shipments. The product of these two yields the number of OUD cases in each county for

each year attributable to shipments.

50.   For the first of these two steps, I begin with data from the National Survey on Drug Use

and Health (NSDUH). I summarize how these data are used and adjusted, and provide a

detailed description of data and methods to estimate morbidity rates in Appendix D. Based on

the adjusted prevalence rates, I estimate number of persons in each year with OUD based on

each of the Bellwether county populations. Tables 7a and 7b in Section IV below report the

prevalence of disease in each year.

51.   In the second step needed to estimate disease prevalence due to shipments, I rely on

Professor Cutler's finding about the share of opioid-related *mortality* attributable to shipments

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[70] Examples of these symptoms include taking opioids in larger amounts or over a longer time period than was
intended, being unsuccessful in efforts to reduce or control opioid use and having cravings or strong urges to use
opioids. For all twelve symptoms, see CDC, Module 5: Assessing and Addressing Opioid Use Disorder (OUD),
available at https://www.cdc.gov/drugoverdose/training/oud/accessible/index.html.

[71] *Ibid*.. The previous edition of the Diagnostic and Statistical Manual from 1994 did not include opioid use
disorder as a diagnosis; rather, it contained two separate diagnoses, opioid dependence and opioid abuse.
Diagnostic and Statistical Manual of Mental Disorders, 4th ed. Washington, DC: American Psychiatric Association;
1994. These were combined into a single disorder in 2013. D.S. Hasin, *et al.*, DSM-5 criteria for substance use
disorders: recommendations and rationale, *American Journal of Psychiatry,* 2013, 170(8), pp. 834-851.

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and assume that the same share applies to *morbidity.*[72] These shares are shown in Tables 7a

and 7b (and are the same as the shares I use in the mortality analysis). Multiplying the number

of persons with OUD in each year by the share attributable to shipments provides the absolute

number of people in each county with disease attributable to shipments in each year. As

identified in Tables 7a and 7b below in Section IV, over the 11-year period from 2006-2016,

there were approximately 109 thousand person-years of opioid-related morbidity due to

shipments in Cuyahoga County and approximately 46 thousand person-years of opioid-related

morbidity due to shipments in Summit County.

Babies born with neonatal abstinence syndrome

52.   Neonatal abstinence syndrome (NAS), also termed neonatal withdrawal,[73] is a

constellation of conditions associated with *in utero* exposure to opioids.[74] It can occur due to

any regular antenatal opioid use, including both illicit and prescribed.[75] The syndrome is a

rapidly growing public health problem, with the incidence of NAS increasing nearly fivefold

between 2000-2012, corresponding with a rise in opioid use and abuse.[76] Babies born with NAS

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[72] Professor Cutler states in his report that "opioid-related mortality is used as a proxy for opioid-related harms" (¶ 27). He explains why mortality is a good proxy for harms in his ¶48.

[73] K. McQueen and J. Murphy-Oikonen, "Neonatal abstinence syndrome," *New England Journal of Medicine,* 2016, 375(25), pp. 2468-2479.

[74] H. Uebel, *et al.*, "Reasons for Rehospitalization in Children who had Neonatal Abstinence Syndrome," *Pediatrics, 2015,* 136(4), e811-e820.

[75] S. Wong, *et al.*, "Substance use in pregnancy," *Journal of Obstetrics and Gynaecology Canada*, 2011, 33(4), pp. 367-384.

[76] S.W. Patrick, *et al*., "Neonatal abstinence syndrome and associated health care expenditures: United States, 2000-2009," *JAMA,* 2012, 307(18), pp. 1934-1940; S.W. Patrick, *et al.*, "Increasing incidence and geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012," *Journal of Perinatology*, August 2015, 35(8), pp. 650-655.

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may exhibit a host of symptoms, including respiratory distress; central nervous-system

symptoms, like tremors and seizure; and gastrointestinal problems, such as poor feeding and

vomiting.[77] The onset of symptoms typically occurs within the first few days following birth, but

timing may vary due to a variety of factors, including the half-life of the specific opiate used.[78]

In this section, I describe the methodology for estimating the number of NAS cases in the

Bellwether counties attributable to opioid shipments.

53.   According to the Ohio Department of Health, virtually all cases of NAS are due to

opioids.[79] I use publicly available on the number of NAS cases by county of residence within

Ohio over the period from 2006-2016 (see Appendix E for details). Tables 8a and 8b in Section

IV below report the number of NAS cases for each year between 2006-2016. I then multiply

these estimates by Professor Cutler's estimates of the share of harm attributable to shipments

to arrive at a number of opioid-related NAS cases *attributable to the shipments*. As reported in

Tables 8a and 8b, between 2006-2016, I estimate that there were 609 cases of opioid-related

NAS attributable to shipments in Cuyahoga County, and 430 cases attributable to shipments in

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[77] Wong et al., op. cit.

[78] Wong et al., op. cit.

[79] See Ohio Department of Health, "Neonatal Abstinence Syndrome (NAS) Hospital Reporting in Ohio, July 2, 2018, available at https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/violence-injury-prevention-program/resources/nas_hospital_reporting_in_ohio. Also see "2017 Ohio Neonatal Abstinence Syndrome County Report," available at https://odh.ohio.gov/wps/wcm/connect/gov/4cad708c-ba99-4b8b-b425-01cfef119c5d/2017+NAS+County+Table+12.3.2018.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORK SPACE.Z18_M1HGGIK0N0JO00QO9DDDDM3000-4cad708c-ba99-4b8b-b425-01cfef119c5d-muueFzr.

Summit County.

Crime

54.   The opioid crisis could increase the number of crimes committed in the Bellwether

communities in several ways. For example, the sale of illegal opioids (*e.g.*, heroin) for any use

or prescription opioids (*e.g.*, OxyContin) for illicit use is a crime. Additionally, people misusing

opioids may commit crimes, such as property theft, to obtain money to buy opioids or their

drug use may lead to other crimes, such as assault.

55.   Appendix F contains the details on how I estimate the number of crimes due to opioid

shipments and the economic costs of those crimes. In sum, I start with a count of the total

number of crimes in different categories, (*e.g.*, motor vehicle theft, prostitution, vandalism)

committed within the Bellwether communities. Counts of incidents within each Bellwether

community come from the National Incident-Based Reporting System (NIBRS) maintained by

the FBI. NIBRS data are a standard source used to measure criminal offenses by criminal

category for all law enforcement agencies (LEAs) that report into NIBRS. Not all LEAs report

their data to the NIBRS.[80] I then apply methods from Professor Cutler's report to determine the

share of these crimes attributable to shipments. As described in his Section IV.A and

summarized in my Appendix F, Professor Cutler uses data from a number of sources to make

this attribution.

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[80] The Bureau of Justice Statistics reported that, "In 2012 NIBRS-contributing agencies served approximately 30 percent of the U.S. population and accounted for 28 percent of all crime reported to the UCR [Uniform Crime Reporting] Program." See Bureau of Justice Statistics, Data Collection: National Incident-Based Reporting System (NIBRS), available at https://www.bjs.gov/index.cfm?ty=dcdetail&iid=301.

56.   Tables 9a and 9b in Section IV below summarize results for the two counties, showing

the impact in terms of incidents of crime on each community for each year, 2006 – 2016. Over

the time period from 2006-2016, there were over almost 44 thousand crimes in Cuyahoga

County and almost 21 thousand in Summit County due to shipments. These numbers are

conservative given the reporting limitations in the NIBRS identified above.

Child maltreatment

57.   Substance abuse, including opioid abuse, is a major cause of child maltreatment.[81]

According to the U.S. Department of Health and Human Services (2019), nearly 700,000

children are subject to maltreatment (includes abuse and neglect) each year in the U.S., with

the majority of cases involving neglect (74.9%).[82] In Ohio in 2017, 24,897 cases of

maltreatment were substantiated or indicated; of these, more than half involved a caregiver

with a substance use risk factor.[83]

58.   I rely on Dr. Young for the number of unique children subject to maltreatment in the

Bellwether counties.[84] I use data from the Cutler Report to estimate the share of maltreated

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[81] See U.S. Department of Health & Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau, "Child Maltreatment 2017,"; 2019, available at https://www.acf.hhs.gov/sites/default/files/cb/cm2017.pdf; O. Mowbray, *et al.*, "Longitudinal Trends in Substance Use and Mental Health Service Needs in Child Welfare," *Children and Youth Services Review,* 73, 2017, pp. 1-8..

[82] *Ibid.*, p. ii; J.J. Doyle and A. Aizer, "Economics of Child Protection: Maltreatment, Foster Care, and Intimate Partner Violence," *Annual Review of Economics*, 2018, 10, pp. 87-108.

[83] Broken down by type of maltreatment (categories not mutually exclusive): neglect: 11,212; medical neglect: 493; physical abuse: 11,892; psychological maltreatment: 914; sexual abuse: 4,339. See U.S. Dep. Health Hum. Serv. 2019. This is likely to be an underestimate, since it relies on reports to Child Protective Services agencies. Victimization surveys and other sources report higher rates of maltreatment. See F. Wulczyn, "Epidemiological Perspectives on Maltreatment Prevention," *The Future of Children*, Fall 2009, 19(2), pp. 39-66; and Doyle & Aizer *op. cit.*

[84] See Young Report, Graphics 12 and 13.

children due to opioids. I then apply Professor Cutler's estimate of the share of opioid-related

harms due to shipments to obtain estimates of the number of children maltreated due to

shipments. These results are reported in Tables 10a and 10b in Section IV for Cuyahoga and

Summit Counties, respectively. Over the period 2006-2016, shipments of prescription opioids

caused 1,391 cases of maltreatment in Cuyahoga County and 1,031 cases of maltreatment in

Summit County. Appendix G contains details of the calculations.

Summary

59.   Harms *caused by shipments of prescription opioids* to the Bellwether communities over

2006 - 2016 quantified in this section are summarized in Table 2.[85]

Table 2
Summary of Harms Due to Opioid Shipments
2006-2016

Harm	Cuyahoga	Summit
Excess deaths	1,535	623
Excess morbidity	108,515	46,183
Excess neonatal abstinence syndrome	609	430
Excess crimes	43,957	20,779
Excess child maltreatment	1,391	1,031

Sources: Tables 5a, 5b, 7a, 7b, 8a, 8b, 9a, 9b, 10a and 10b of this Report.

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[85] Note that this is not an exhaustive list of harms.

60.   I conclude that shipments of prescription opioids significantly interfered with public health, safety, peace and comfort of the members of the Bellwether communities with continuing and long-lasting effects.

C. The Interference from Shipments was Unreasonable

61.   I consider the question of whether the shipments of prescription opioids were reasonable or unreasonable from two perspectives. The first perspective considers whether the shipments were reasonable from the standpoint of being used for clinically justified treatment. The second perspective considers whether the shipments were reasonable from the standpoint of economic costs and benefits.

Share of shipments for scientifically acceptable treatment

62.   I have been instructed by counsel to assume that the Court will conclude that, under applicable public nuisance law and in the context of a prescription medication, the meaning of "unreasonable" is, in substance, "not justified by clinical need." In other words, a "reasonable" shipment of opioids would be to treat a patient in accordance with scientifically acceptable medical criteria. Shipments not for such a purpose are not reasonable.

63.   Using epidemiological data and medical opinions about scientifically acceptable uses, treatments and dosages for opioids, Professor Rosenthal has calculated a theoretical maximum for quantities of prescription opioids (measured in MMEs) for three patient groups needing treatment for pain.[86] She cites professional academic articles as well as relying upon Dr. Schumacher and Dr. Parran in her selection of end-of-life cancer patients, trauma patients and

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[86] Rosenthal Report, Section X.

surgery patients as those patient groups appropriately treated by opioids. Professor Rosenthal

also relies on some of the same sources to identify the average dosage level and treatment

durations that are appropriate for these patient groups.

64.   I have been advised by counsel that Dr. Schumacher will testify that at most, opioids are

properly indicated for the short-term treatment of severe acute pain (e.g., trauma or post-

surgical pain); end-of-life pain/hospice care; and cancer pain from active malignant disease.

Chronic opioid therapy is not recommended for most common chronic pain conditions,

including low back pain, centralized pain such as fibromyalgia, and headache pain. In less

common chronic pain conditions (such as pain from advanced multiple sclerosis, sickle cell

disease, pain following spinal cord injury and paraplegia, or post-herpetic neuralgia), which

comprise a small percentage of chronic pain patients, opioids may be considered a third-line

therapy (taken if other therapies are ineffective or contraindicated) for moderate and severe

pain. However, in other neurologic conditions such as polyneuropathy, no functional status

markers were improved by long-term use of opioids, adverse outcomes were more common

among patients with polyneuropathy receiving long-term opioids, including depression opioid

dependence and opioid overdose. In addition to diagnosis, clinicians should consider risk, and

some patients may not be suitable candidates on the basis of that risk. Given the narrow

categories that may indicate opioids for chronic use, opioids' position as third-line therapy, and

the significant risks associated with its use, long-term opioid therapy for persons with chronic

pain conditions is, at most, indicated in fewer than 5% of patients with chronic pain and likely

significantly fewer. For all proper indications other than terminal cancer, palliative care and